BOX PCT

ATTORNEY'S DOCKET NO: 24320

U.S. DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE	DATE: 10 May 2001 (10.05.2001)
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371	U.S. APPLN. NO. (If known): 09/831503 Not Yet Assigned

INTERNATIONAL APPLICATION NO.: PCT/CH99/00521	INTERNATIONAL FILING DATE: 05 November 1999 (05.11.99)	PRIORITY DATE CLAIMED: 11 November 1998 (11.11.98)

TITLE OF INVENTION: **VEHICLE ROOFLINING AND METHOD FOR PRODUCING THE SAME**

APPLICANT(S) FOR DO/EO/US: AGGARWAL, Anuj; KHAN, Hameed; CREPEAU, Howard; ALTS, Thorsten

Applicant hereby submits to the Unites States Designated/Elected Office (DO/EO/US) the following items and other information:

1. X This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.

2. __ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.

3. X This express request to begin national examination procedures (35 USC 371(f) The submission must include items(5), (6), (9) and (21) indicated below.

4. X A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. X A copy of the International Application as filed (35 U.S.C. 371(c)(2)):

   a. X is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ___ has been communicated by the International Bureau.
   c. ___ is not required, as the application was filed in the United States Receiving Office (RO/US)

6. X A English translation of the International Application as filed (35 U.S C. 371(c)(2).

7. X Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))

   a. __ are attached hereto (required only if not transmitted by the International Bureau).
   b. __ have been communicated by the International Bureau.
   c. __ have not been made; however, the time limit for making such amendments has NOT expired.
   d. X have not been made and will not be made.

8. ___ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ___ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. __ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

ITEMS 11 to 20 BELOW CONCERN OTHER DOCUMENT(S) OR INFORMATION INCLUDED:

11. ___ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. ___ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. X A **FIRST** preliminary amendment.
14. ___ A **SECOND** or **SUBSEQUENT** preliminary amendment
15. ___ A substitute specification.
16. ___ A change of power of attorney and/or address letter.
17. ___ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter2 and 35 USC 1821 - 1825
18. ___ A second copy of the published international application under 35 USC 154(d)(4)
19. ___ A second copy of the English language translation of the international application under 35 USC 154(d)(4)
20. X Other items or information:

TRANSMITTAL FORM; FEE CALCULATION; INTERNATIONAL PUBLICATION WO 00/27671; INTERNATIONAL PUBLICATION DATE 18 MAY 2000 WITH ENGLISH TRANSLATION CONSISTING OF 15 PAGES INCLUDING; 1 COVER SHEET CONTAINING THE ABSTRACT; 9 PAGES TEXTUAL SPECIFICATION, 3 PAGES OF 12 CLAIMS; 2 SHEETS DRAWINGS; PRELIMINARY AMENDMENT WITH CLEAN COPY AND MARKED UP COPY; UNEXECUTED INVENTOR'S DECLARATION; PCT/ISA/210 INTERNATIONAL SEARCH REPORT; PCT/IPEA/409 INTERNATIONAL PRELIMINARY EXAMINATION REPORT; PCT/RO/101 REQUEST.

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U.S. APPLICATION NO. (if known) not yet assigned 09/831503	INTERNATIONAL APPLICATION NO. PCT/CH99/00521	DATE: 10 May 2001 (10.05.2001)

17. x The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO:.....$860.00	$860.00	
International preliminary examination fee paid to USPTO (37 CFR 1.482).....$690.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....$710.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....$1000.00		
International preliminary examination fee (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....$ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$ 860.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NO. FILED	NO. EXTRA	RATE		
TOTAL	12 -20=	0	X $ 18.00	$ **0.00**	
INDEPENDENT	1 - 3=	0	X $ 80.00	$ 0.00	
Multiple dependent claims(s) (if applicable)			+ $260.00	$ 0.00	
			TOTAL OF ABOVE CALCULATIONS =	$ **860.00**	
Reduction by ½ for asserting small entity, if applicable. (Note 37 CFR 1.9, 1.27, 1.28).				$ **0.00**	
			SUBTOTAL =	$ 860.00	
Processing fee of **$130.00** for furnishing the English translation later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ 0.00	
			TOTAL NATIONAL FEE =	$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 per property +**				$ **0.00**	
			TOTAL FEES ENCLOSED =	$ **860.00**	
				Amount to be: refunded	$
				charged	$

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U.S. APPLICATION NO. (if known) not yet assigned 09/831503	INTERNATIONAL APPLICATION NO. PCT/CH99/00521	DATE: 10 May 2001 (10.05.2001)

a. X One check in the amount of $860.00 to cover the above fees is enclosed.

b. ___ Please charge my Deposit Account No. 14-0112 in the amount of $_____ to cover the above fees. (A duplicate copy of this sheet is enclosed.)

c. X The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-0112.

d. ___ Fees are to be charged to a credit card ___ WARNING: Information on this form may become public ___Credit Card Information should not be included on this form. ___ Provide credit card information and authorization on PTO-2038 ___

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed to request that the application be restored to pending status.

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Rev. 02/98

BOX PCT

Attorney Docket No. 24320

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
AGGARWAL, Anuj; KHAN, Hameed; CREPEAU, Howard; ALTS, Thorsten
International Application No. PCT/CH99/00521
Serial No. NOT YET ASSIGNED
International Filing Date: 05 November 1999 (05.11.99)
Filed: May 10, 2001
For: **VEHICLE ROOFLINING AND METHOD FOR PRODUCING THE SAME**

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examining on the merits and calculating the filing fee for the national phase application filed herewith, please enter the following amendments:

IN THE CLAIMS:

Please amend claims 3, 4, 5, 8, 9, 10 and 11 of the application as per attached with this preliminary amendment.

REMARKS

The above amendments have been made to remove multiple dependencies from the claims and to conform them to U.S. practice. No new matter has been added. Pursuant to the new rules implementing the AIPA, a clean copy of the amended claims and a marked-up copy of the amended claims is attached.

Respectfully submitted,

NATH & ASSOCIATES PLLC

By: _____
Gary M. Nath
Registration No. 26,965
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Date: May 10, 2001
NATH & ASSOCIATES PLLC
1030th Street, NW - 6th Floor
Washington, D.C. 20005
GMN/dd:AMENDpreml.AIPA

AMENDED CLAIMS - CLEAN COPY

Patent Claims

1. Lining for a vehicle roof (2) with an air-permeable support layer (3), which support layer (3) has a first air-permeable reinforcement layer (4) on the vehicle side and a second air-permeable reinforcement layer (5) on the passenger compartment side, the first reinforcement layer on the vehicle roof side having an air-impermeable back layer (9), the second reinforcement layer (5) being provided with an air-permeable decorative layer (6) on the passenger compartment side and the individual layers being bonded to each other with an air-permeable adhesive (7), characterised in that to make an acoustically optimisable and aesthetically-resistant vehicle rooflining, a semi-permeable and migration-resistant barrier layer (8) is provided between the second reinforcement layer (5) and the decorative layer (6).

2. Lining according to claim 1, characterised in that the layers on the passenger compartment side have an air flow resistance of $500 Nsm^{-3} < R1 < 2500\ Nsm^{-3}$, especially $900\ Nms^{-3} < R1 < 1900 Nsm^{-3}$.

3. (amended) Lining according to claim 1, characterised in that the air-permeable support layer (3) is made from a PU foam.

4. (amended) Lining according to claim 1, characterised in that the reinforcement layer (4) comprises a glass fibre layer.

5. (amended) Lining according to claim 1, characterised in that the barrier layer (8) consists of a mixed fibre fabric, weighing approximately 20 g/m^2 to 60 g/m^2 and especially a mixed fibre fabric weighing approximately 45 g/m2.

6. Lining according to Claim 5, characterised in that the barrier layer (8) contains chemically-bonded cellulose and polyester fibres.

7. Lining according to Claim 6, characterised in that the surface of the barrier layer is treated accordingly to achieve the required wetting properties.

8. (amended) Lining according to Claim 3, characterised in that the barrier layer (8) is migration-resistant to softeners, decomposition products used by ageing and / or additives from a PU foam layer or the adhesive films.

9. (amended) Lining according to Claim 1, characterised in that the barrier layer (8) has a thickness of 0.2 mm to 1.0 mm, especially 0.285 mm.

10. (amended) Lining according to Claim 1, characterised in that adhesive (7) is a conventional two-pack PU adhesive.

11. (amended) Lining according to Claim 1, characterised in that decorative layer (6) is an air-permeable PE non-woven fabric layer.

12. (amended) Method for making a vehicle rooflining according to Claim 1, characterised in that:

(a) An air-impermeable back layer (9) is covered with first reinforcement fibres (11), especially glass fibres, and a support layer (3), especially a PU foam layer, is applied to the reinforcement fibres (11);

(b) The back layer (9), reinforcement fibres (11) and support layer (3) are impregnated jointly with a pre-determined quantity of a first component (12) of an adhesive (7) and to do this, are transported together through a bath (13) filled with this first component (12) and first squeezing rollers (14) disposed downline, for example;

(c) The support layer (3) impregnated in this way is covered with second reinforcement fibres (15), especially glass fibres, and then wetted, especially sprayed, with a second component (16) of the adhesive (7);

(d) A semi-permeable and migration-resistant barrier layer (8) is applied to the second reinforcement fibres (15) and is then pressed with the other layers (9, 11, 3, 15) with the aid of second

squeezing rollers (17), for example, in order to allow the two adhesive components (12, 16) to react with each other, before a self-adhesive decorative layer (6) is applied to this barrier layer (8);

(e) The layers applied to each other in this way are then cut to size as required and hot shaped.

13. Lining according to Claim 1, characterized in that the barrier layer (8) is migration-resistant to softeners, decomposition products used by ageing and / or additives from a PU foam layer or the adhesive films.

AMENDED CLAIMS - MARKED-UP COPY

Patent Claims

1. Lining for a vehicle roof (2) with an air-permeable support layer (3), which support layer (3) has a first air-permeable reinforcement layer (4) on the vehicle side and a second air-permeable reinforcement layer (5) on the passenger compartment side, the first reinforcement layer on the vehicle roof side having an air-impermeable back layer (9), the second reinforcement layer (5) being provided with an air-permeable decorative layer (6) on the passenger compartment side and the individual layers being bonded to each other with an air-permeable adhesive (7), characterised in that to make an acoustically optimisable and aesthetically-resistant vehicle rooflining, a semi-permeable and migration-resistant barrier layer (8) is provided between the second reinforcement layer (5) and the decorative layer (6).

2. Lining according to claim 1, characterised in that the layers on the passenger compartment side have an air flow resistance of $500 Nsm^{-3} < R1 < 2500 Nsm^{-3}$, especially $900 Nms^{-3} < R1 < 1900 Nsm^{-3}$.

3. (amended) Lining according to [one of claims 1 or 2] claim 1, characterised in that the air-permeable support layer (3) is made from a PU foam.

4. (amended) Lining according to [one of claims 1 to 3] claim 1, characterised in that the reinforcement layer (4) comprises a glass fibre layer.

5. (amended) Lining according to [one of claims 1 to 4] claim 1, characterised in that the barrier layer (8) consists of a mixed fibre fabric, weighing approximately 20 g/m^2 to 60 g/m^2 and especially a mixed fibre fabric weighing approximately 45 g/m2.

6. Lining according to Claim 5, characterised in that the barrier layer (8) contains chemically-bonded cellulose and polyester fibres.

7. Lining according to Claim 6, characterised in that the surface of the barrier layer is treated accordingly to achieve the required wetting properties.

8. (amended) Lining according to [Claims 1 - 7] Claim 3, characterised in that the barrier layer (8) is migration-resistant to softeners, decomposition products used by ageing and / or additives from [the] a PU foam layer or the adhesive films.

9. (amended) Lining according to [Claims 1 to 8] Claim 1, characterised in that the barrier layer

(8) has a thickness of 0.2 mm to 1.0 mm, especially 0.285 mm.

10. (amended) Lining according to [Claims 1 to 9] Claim 1, characterised in that adhesive (7) is a conventional two-pack PU adhesive.

11. (amended) Lining according to [one of Claims 1 to 10] Claim 1, characterised in that decorative layer (6) is an air-permeable PE non-woven fabric layer.

12. (amended) Method for making a vehicle rooflining according to Claim 1, characterised in that:

(a) An air-impermeable back layer (9) is covered with first reinforcement fibres (11), especially glass fibres, and a support layer (3), especially a PU foam layer, is applied to the reinforcement fibres (11);

(b) The back layer (9), reinforcement fibres (11) and support layer (3) are impregnated jointly with a pre-determined quantity of a first component (12) of an adhesive (7) and to do this, are transported together through a bath (13) filled with this first component (12) and first squeezing rollers (14) disposed downline, for example[.];

(c) The support layer (3) impregnated in this way is covered with second reinforcement fibres (15), especially glass fibres, and then wetted, especially sprayed, with a second component (16) of the adhesive (7)[.];

(d) A semi-permeable and migration-resistant barrier layer (8) is applied to the second reinforcement fibres (15) and is then pressed with the other layers (9, 11, 3, 15) with the aid of second squeezing rollers (17), for example, in order to allow the two adhesive components (12, 16) to react with each other, before a self-adhesive decorative layer (6) is applied to this barrier layer (8)[.];

(e) The layers applied to each other in this way are then cut to size as required and hot shaped.

Please add the following new claim:

--13. Lining according to Claim 1, characterized in that the barrier layer (8) is migration-resistant to softeners, decomposition products used by ageing and / or additives from a PU foam layer or the adhesive films.--

Vehicle rooflining and method for producing the same

The present invention relates to a vehicle rooflining according to the pre-characterising clause of Claim 1 and a method for producing the same.

This vehicle rooflining is characterised by an especially good acoustic behaviour and is suitable for an ultra-light construction.

Because of their low intrinsic stability, large area vehicle parts, especially vehicle roofs, tend to deform, vibrate and oscillate during driving. This behaviour is conventionally counter-acted by applying insulating material, especially heavy layers of bitumen. In order to reduce the transmitting of driving noises into the vehicle compartment, the automotive industry has used multi-layer sound insulating systems for some time now. As a rule, these sound insulating systems are designed as spring-mass systems and comprise an air-tight heavy layer coupled with a resilient layer in order to absorb the vibrations of the large area body parts and insulate sound transmission.

A sound insulation system of this kind is disclosed in EP-0'255'332, for example, and comprises a semi-flexible support layer with which the rooflining can be braced against the vehicle roof in the manner of a snap connection. A classic spring-mass system with a resilient, sound-absorbing foam layer and a visco-elastic, closed cell heavy layer (filled with bitumen) is pressed against the vehicle roof with this support layer.

For example, a sound-absorbing rooflining is known from EP-0'637'820, which essentially comprises a semi-rigid PU foam layer, approximately 5 mm - 15 mm thick, and a 4 mm - 10 mm

resilient nonwoven fabric layer, both layers being air-permeable. In the case of this embodiment, the foam layer is reinforced both sides with glass fibres and has an air-permeable decorative layer on the passenger compartment side. The individual layers are bonded to each other with an air-permeable adhesive, especially a PU adhesive. This sound-absorbing rooflining is also a classic spring-mass system.

However, it has been found with this type of rooflining that because of the open cell construction of these sound absorbers, their adhesive components penetrate the decorative layer relatively quickly when these rooflinings are made and result in visually perceptible stains and therefore to a relatively high rejection rate. Therefore, the use of permeable layers leads directly to an undesirable detrimental effect on the appearance of the rooflinings.

In addition, spring-mass constructions always lead to resonance interference in the sound insulation, which is normally in the frequency range of the lower engine orders and is especially undesirable there.

However, the general objective of the automotive industry is to reduce the weight of vehicles. This has the result that thinner and lighter body and lining parts are being increasingly used and these can result in considerable acoustic problems.

Therefore, it has already been suggested in FR 2 503 721, for example, that a light rooflining be made which essentially consists of an open cell and glass fibre-reinforced foam layer which is covered with a decorative layer and has an air-impermeable polyethylene foil between

this decorative layer and the glass fibre-reinforced foam layer to prevent the permeating of adhesive components into the decorative layer. On account of this foil, this suggested rooflining has a poor acoustic absorption which could be improved at best by perforation. However, perforation of the PE foil in this manner can lead to visually perceptible changes in the decorative layer. In the case of the manufacturing method disclosed in this specification, the back layer on the roof side is perforated, i.e. air-permeable, and therefore conflicts with modern legal regulations concerning the design of vehicle linings. These regulations forbid a direct air flow between vehicle roof and passenger compartment.

Therefore, the object of the invention is to create a rooflining which, depending on its specific use, has optimum sound absorption and an aesthetically-resistant appearance at the same time.

This object is achieved according to the invention by a lining with the features of Claim 1 and especially in that a semi-permeable and migration-resistant barrier layer is provided between an air-permeable decorative layer and a multi-layer structure element. The multi-layer structure element is also air-permeable and has a support layer, especially a PU foam layer, which is provided both sides with an air-permeable reinforcement layer especially made from glass fibres. These layers are bonded together in a known way. The decorative layer may consist of a non-woven fabric or another air-permeable material, e.g. a knitted glass fabric. The semi-permeable and migration-resistant barrier layer used according to the invention is impermeable for and migration-resistant against the adhesive used, or their components or additives on the one hand and is micro-porous on the other, i.e. air-permeable,

and has a thickness of $0.1 < d < 1.0$ mm and is designed in such a way as to produce an air flow resistance of $500Nsm^{-3}$, $< R1 < 2500Nsm^{-3}$, especially of $900Nms^{-3} < R1 < 1900Nsm^{-3}$. It is important for optimising the acoustic effectiveness of the vehicle rooflining that the air flow resistance on the passenger compartment side is in the desired range. In addition, the air-permeable, i.e. open cell barrier layer, is made from a material which is semi-permeable and migration-resistant and especially prevents the penetration or permeation and / or migration of the adhesive used, or its components and / or the softeners used, the decomposition products caused by ageing and / or the additives from the PU foam layer or the adhesive layers. These barrier layers are available on the market and are made from chemically-bonded cellulose and polyester fibres, for example.

One preferred method for making a lining according to the invention provides for depositing reinforcement fibres, e.g. glass fibres or polyester fibres, on a continuously unwound bottom layer or back layer, especially in polyethylene, and applying a continuously unwound support layer, especially a PU foam layer, to it. This layer sequence in the form of a sheet is impregnated with the first component of an adhesive, especially a PU adhesive. According to a preferred embodiment, this layer sequence is transported as sheet through a bath filled accordingly. In order to be able to control the amount of the first adhesive component applied, this impregnated layer sheet is transported through a pair of squeezing rollers. Reinforcement fibres are again applied to the layer sheet treated in this way and a second

adhesive component is sprayed on before a semi-permeable and migration-resistant barrier layer is applied and pressed onto the other layers. A decorative layer, e.g. a 100 g/m^2 PE non-woven fabric, is applied to this barrier layer.

The sheet made in this way is then cut into suitable pieces and shaped in a known way, i.e. with heated moulding press dies, in order to obtain the vehicle rooflinings wanted.

Naturally, the materials for this lining and the chemicals needed to make this lining are not limited to the selection disclosed here as an example. A person skilled in the art will choose suitable materials and chemicals depending on the range of application of the product according to the invention. Naturally, the continuous manufacturing method disclosed above may also be carried out sheet by sheet or step by step.

The invention is explained in more detail below on the basis of the diagrams and an example of an embodiment, where:

Fig. 1 shows a diagramatic section diagram of the construction of a lining part according to the invention;

Fig. 2 a diagramatic section of the method for making a lining according to the invention.

Fig. 3 a comparative graph of the frequency-related sound absorption of the lining according to the invention.

Figure 1 shows a diagram of the construction of a lining according to the invention. This lining has a central support layer 3, which consists of an air-permeable material, preferably an open cell PU foam. In a preferred embodiment, this foam layer 3 has a thickness of approximately 5 mm to 30 mm, especially 20 mm, and has a volume of 20 kg/m^2 to 60 kg/m^2. A reinforcement layer 4 and 5 is disposed on each side of support layer 3, respectively. Preferably, these reinforcement layers are made from glass fibres and are bonded to the support layer 3 with an adhesive 7. According to a preferred embodiment, a glass fibre layer with a weight per unit area of approximately 50 g/m^2, whose thickness corresponds approximately to 1 to 3 times the diameter of the fibres, is used on both sides. Naturally, other suitable materials, i.e. rigid materials, may be used for the reinforcement layers. It is essential for the present invention that the aforementioned individual layers are air-permeable and that adhesive 7 also allows an air flow through these layers. An air-impermeable back layer 9, preferably in polyethylene, is provided on the vehicle roof side. This back layer 9 prevents air from being able to flow from the passenger compartment through the air-permeable lining 1 into the space between the vehicle roof 2 and the lining 1. An air-permeable decorative layer 6, e.g. a 100 g/m^2 heavy PE non-woven fabric, is applied on the passenger compartment side. According to the invention, a micro-porous, semi-permeable and migration-resistant barrier layer 8 lies between the decorative layer 6 and the support layer 3. In a preferred embodiment, this barrier layer 8 is made from cellulose and polyester fibres bonded together and is gas-permeable, especially air-permeable, on the one hand but impermeable on the other, i.e. impermeable for at least the liquid or viscous substances used when making the lining, especially adhesive

components, and therefore acts as a barrier layer for the adhesive 7 used. In addition, this barrier layer 8 is made from a material which prevents the migration of adhesive components, any softeners, decomposition products caused by ageing and / or chemical additives. The air-permeability is achieved by the micro-porous and air-permeable structure of this barrier layer 8. The air flow-resistance through this layer 8 can be pre-determined especially through the choice of fibre diameter, barrier layer density and its thickness. In a preferred embodiment, this barrier layer 8 has a thickness of $0.1 < d < 1.0$ mm and is designed in such a way to produce an air flow resistance of $500 Nsm^{-3} < R1 < 2500 Nsm^{-3}$, especially $900 Nsm^{-3} < R1 < 1900 Nsm^{-3}$ in the lining layers on the passenger compartment side. The surfaces of this barrier layer 8 can be treated, i.e. wetted, for the adhesives interacting with the surfaces, whereas the centre area of this barrier layer 8 can have a pronounced repellent effect for these adhesives. Suitable surface treatments, e.g. scarfing, with chemical primer or corona treatment, are known to a person skilled in the art. The wetting capability of these barrier layer surfaces is chosen in such a way that these surfaces enter into adhesion with the adhesives used, but these adhesives cannot form any closed, air-impermeable film. In this preferred embodiment, a barrier layer of polyester and cellulose fibres with a weight per unit area of 20 g/m^3 to 60 g/m^2, especially 40 g/m^2 is used. The weight of the adhesive necessary is approximately 60 g/m^2. A lining with a total weight of approximately 800 g/m^2 and a thickness of approximately 22 mm can be made with this.

The method illustrated in Fig. 2 for making a lining according to the invention uses a thin back layer 9 which is taken down continuously from a roll. Preferably, this back layer consists of polyethylene and serves as an

impermeable under layer to which the other materials are applied. In a first method step, reinforcement fibres 11, especially glass fibres, are strewn loosely over this back layer 9. A support layer 3, especially a PU foam layer, is then placed on these glass fibres 11. This support layer 3 may also be drawn down from a roll. In a further step of the method, these three layers 9, 11, 3 are transported through a bath 13 which contains a first adhesive component. To be able to control the amount of this adhesive component applied, this impregnated layer sequence is transported between two first squeezing rollers 14. After this squeezing process, reinforcement fibres 15, especially glass fibres, are scattered on again and then sprayed with a second adhesive component 16. The micro-porous, semi-permeable and migration-resistant barrier layer 8 is applied to the material sheet treated in this way and pressed with the aid of a second pair of squeezing rollers 17. A decorative layer 6 is applied in a next method stage. This material is then cut to size and transformed into the required shape in a heated press die. Naturally, the continuous manufacturing method disclosed here as an example may be simply modified by a person skilled in the art to form a discontinuous, i.e. step-by-step manufacturing method.

The curves shown in Fig. 3 show the acoustic effectiveness of the lining according to the invention. In this case, curve A represents a sound absorption behaviour of a vehicle rooflining without barrier layer 8 according to the invention. It is evident from this curve that an absorption of more than 0.8 can be achieved through the open cell construction of the layers on the passenger compartment side. However, such high absorption coefficients are undesirable in the vehicle acoustics range, because this greatly prejudices the intelligibility

of speech in the passenger compartment. The path of this curve (a) also shows inadequate absorption of the vehicle rooflining in the range below 1500 Hz. On the other hand, curve (b), characterising the absorption behaviour of the lining according to the invention with micro-porous barrier layer, shows that this rooflining already has satisfactory absorption at frequencies of 800 Hz and the absorption coefficient for higher frequencies fluctuates in the range between 0.7 and 0.8. This comparison illustrates the advantages obtained with the vehicle rooflining according to the invention.

Naturally, other embodiments of this vehicle rooflining are within the range of the normal technical scope of a person skilled in the art. With his knowledge, a person skilled in the art will especially choose suitable materials and adhesives for making a vehicle rooflining according to the invention. The special fashioning or shaping of the rooflining also belongs to the normal technical scope of a person skilled in the art.

Patent Claims

1. Lining for a vehicle roof (2) with an air-permeable support layer (3), which support layer (3) has a first air-permeable reinforcement layer (4) on the vehicle side and a second air-permeable reinforcement layer (5) on the passenger compartment side, the first reinforcement layer on the vehicle roof side having an air-impermeable back layer (9), the second reinforcement layer (5) being provided with an air-permeable decorative layer (6) on the passenger compartment side and the individual layers being bonded to each other with an air-permeable adhesive (7), characterised in that to make an acoustically optimisable and aesthetically-resistant vehicle rooflining, a semi-permeable and migration-resistant barrier layer (8) is provided between the second reinforcement layer (5) and the decorative layer (6).

2. Lining according to claim 1, characterised in that the layers on the passenger compartment side have an air flow resistance of $500Nsm^{-3} < R1 < 2500\ Nsm^{-3}$, especially $900\ Nms^{-3} < R1 < 1900Nsm^{-3}$.

3. Lining according to one of claims 1 or 2, characterised in that the air-permeable support layer (3) is made from a PU foam.

4. Lining according to one of claims 1 to 3, characterised in that the reinforcement layer (4) comprises a glass fibre layer.

5. Lining according to one of claims 1 to 4, characterised in that the barrier layer (8) consists of a mixed fibre fabric, weighing approximately 20 g/m^2 to 60 g/m^2 and especially a mixed fibre fabric weighing approximately 45 g/m2.

6. Lining according to Claim 5, characterised in that the barrier layer (8) contains chemically-bonded cellulose and polyester fibres.

7. Lining according to Claim 6, characterised in that the surface of the barrier layer is treated accordingly to achieve the required wetting properties.

8. Lining according to Claims 1 - 7, characterised in that the barrier layer (8) is migration-resistant to softeners, decomposition products used by ageing and / or additives from the PU foam layer or the adhesive films.

9. Lining according to Claims 1 to 8, characterised in that the barrier layer (8) has a thickness of 0.2 mm to 1.0 mm, especially 0.285 mm.

10. Lining according to Claims 1 to 9, characterised in that adhesive (7) is a conventional two-pack PU adhesive.

11. Lining according to one of Claims 1 to 10, characterised in that decorative layer (6) is an air-permeable PE non-woven fabric layer.

12. Method for making a vehicle rooflining according to Claim 1, characterised in that

(a) An air-impermeable back layer (9) is covered with first reinforcement fibres (11), especially glass fibres, and a support layer (3), especially a PU foam layer, is applied to the reinforcement fibres (11)

(b) The back layer (9), reinforcement fibres (11) and support layer (3) are impregnated jointly with a pre-determined quantity of a first component (12) of an adhesive (7) and to do this, are transported together through a bath (13) filled with this first component (12) and first squeezing rollers (14) disposed downline, for example.

(c) The support layer (3) impregnated in this way is covered with second reinforcement fibres (15), especially glass fibres, and then wetted, especially sprayed, with a second component (16) of the adhesive (7).

(d) A semi-permeable and migration-resistant barrier layer (8) is applied to the second reinforcement fibres (15) and is then pressed with the other layers (9, 11, 3, 15) with the aid of second squeezing rollers (17), for example, in order to allow the two adhesive components (12, 16) to react with each other, before a self-adhesive decorative layer (6) is applied to this barrier layer (8).

(e) The layers applied to each other in this way are then cut to size as required and hot shaped.

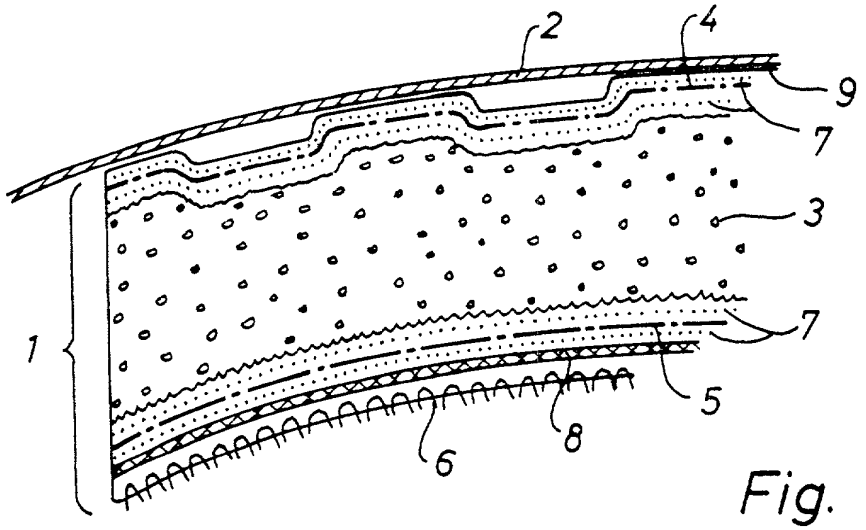

Fig. 1

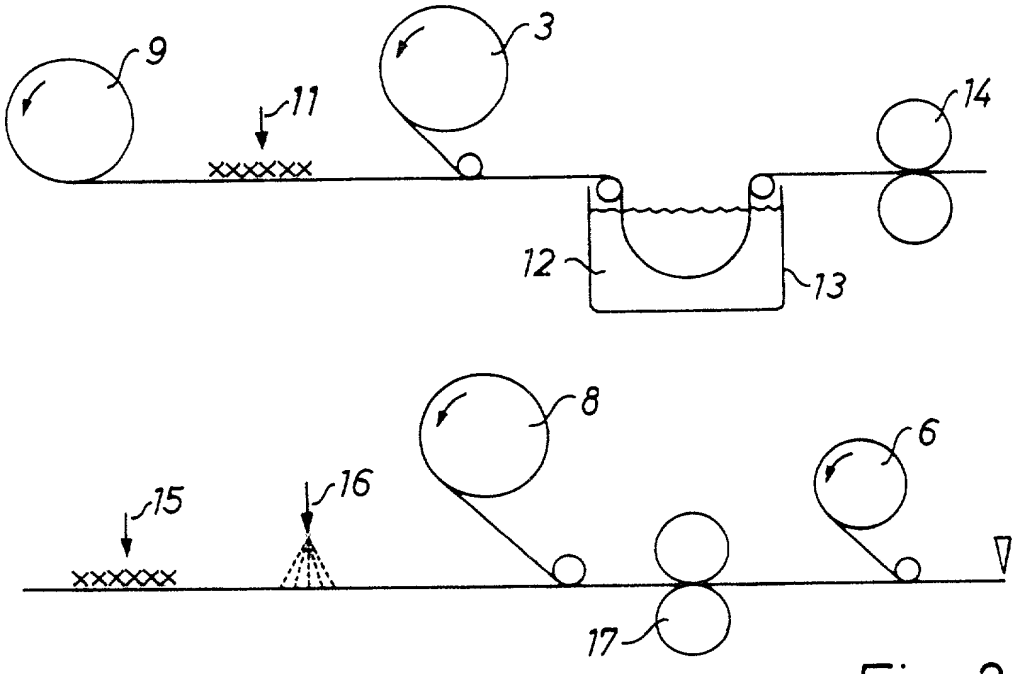

Fig. 2

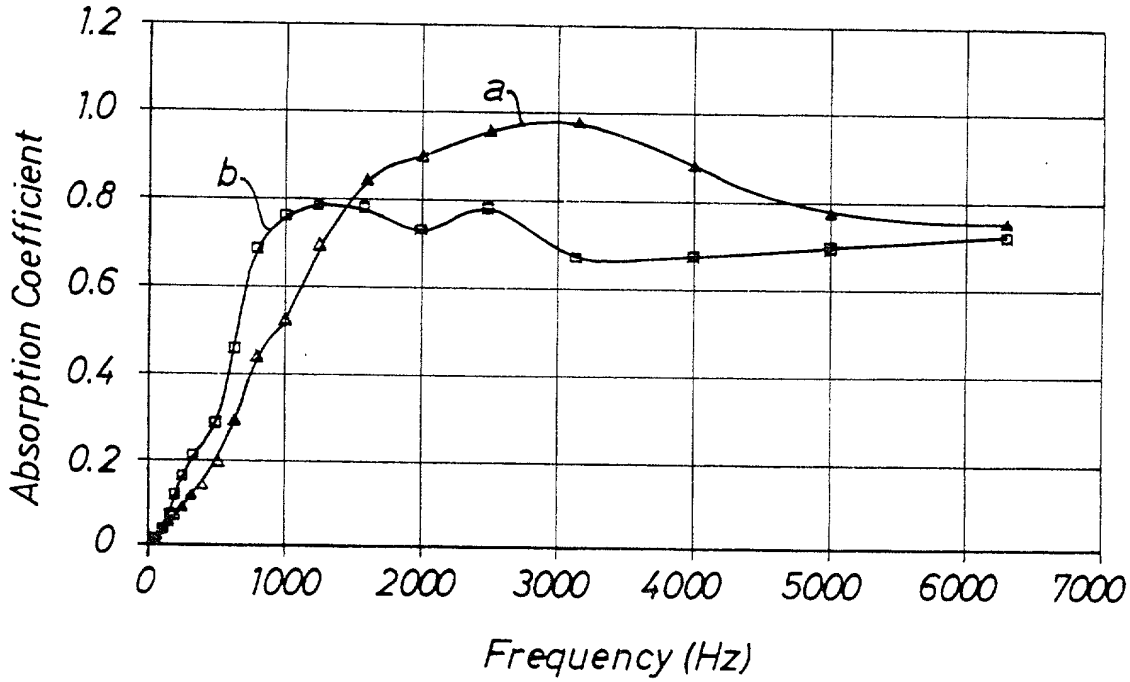
1.2
1.0
0.8
0.6
0.4
0.2
0
Absorption Coefficient
a
b
0
1000
2000
3000
4000
5000
6000
7000
Frequency (Hz)

Fig. 3

DECLARATION FOR PATENT APPLICATION	Attorney Docket: 24320 Page 1 of 2

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VEHICLE ROOFLINING AND METHOD FOR PRODUCING THE SAME

the specification of which: (check one)

[ ] is attached hereto.

[X] was filed on 5 November 1998, as Serial No. PCT/CH99/00521,

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DECLARATION FOR PATENT APPLICATION	Attorney Docket: 24320 Page 2 of 2

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Full name of sole or first inventor: Anuj AGGARWAL

Inventor's Signature _____ Date _____

Residence: 1001 S. Main Street, Nr. 235, Crown Point, IN 46307, U.S.A.

Country of Citizenship: INDIA

Post Office Address: same as residence

Full name of second inventor: Hameed KHAN

Inventor's Signature [signature] Date MAY 21, 01.

Residence: 1355 Covington Ct., Crown Point, IN 46307, U.S.A.

Country of Citizenship: U.S.A.

Post Office Address: same as residence

Full name of third inventor: Howard CREPEAU

Inventor's Signature _____ Date _____

Residence: 674 Driftwood Circle, Lowell, IN 46356

Country of Citizenship: U.S.A.

Post Office Address: Same as residence

Full name of fourth inventor: Thorsten ALTS

Inventor's Signature _____ Date _____

Residence: Pestalozzistrasse 32, 64401 Gross-Bieberau

Country of Citizenship: GERMANY

Post Office Address: same as residence

DECLARATION FOR PATENT APPLICATION	Attorney Docket: 24320 Page 1 of 2

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020529

PATENT TRADEMARK OFFICE

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1-00

Full name of sole or first inventor: Anuj AGGARWAL

Inventor's Signature Anuj Aggarwal Date 08/14/01

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Inventor's Signature Howard Crepeau Date 6/12/01

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Full name of fourth inventor: Thorsten ALTS

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Inventor's Signature T. Alts Date 05/14/2001

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